

DORSAL HAIR LENGTH AND COAT COLOR IN ABERT'S SQUIRREL (*SCIURUS ABERTI*)

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ABSTRACT.— *Sciurus aberti*, like many other sciurids including *Sciurus vulgaris* and *Sciurus carolinensis*, shows a coat color polymorphism. Like *Sciurus vulgaris*, *Sciurus aberti* shows a correlation between coat color phase and dorsal hair length. Both squirrels show an increased frequency of dark morphs in the northern portions of their respective ranges.

A number of sciurids, including *Sciurus aberti* (Ramey and Nash 1976), *Sciurus carolinensis* (Creed and Sharp 1958), and *Sciurus vulgaris* (Voipio 1956) show coat color polymorphisms. The genetics of these polymorphisms seem to involve mutations at the extension locus as with *Sciurus vulgaris*, mutations at the agouti locus as with *Sciurus carolinensis*, or mutations at both loci as with *Sciurus aberti* (Searle 1968, Ramey and Nash 1976). For the above three species, field observation and sampling have established that the darker morphs are more common in the northern reaches of their respective ranges or at higher elevations.

Voipio and Hissa (1970) measured hair density and length and related them to pelage color. They found significant differences for hair densities, hair lengths, and hair weights and concluded that hair density was greater for the dark phase of the European Red Squirrel (*Sciurus vulgaris*) than for the light (red) phase.

The present study was designed to examine the relationship between hair length and coat color in Abert's Squirrel (*Sciurus aberti ferreus*). This subspecies occurs in north central Colorado and is the best documented for color polymorphism. It occurs in two main phases: gray and nearly black as well as some intermediate phenotypes (Nash and Seaman 1977). The gray morphs typically show an agouti pigment distribution and the black forms are typically nonagouti. If the squirrels are classified on the basis of pigment distribution, a color range for each group is demon-

strated, with those in the nonagouti group tending to be much darker than those in the agouti group.

Dorsal guard hairs and underfurs were measured on 23 specimens of *Sciurus aberti ferreus*. Because Abert's Squirrels were fully protected in Colorado at the time measurements were taken, museum specimens from Colorado State University and the Denver Museum of Natural History were used. A small tuft of hairs was removed at skin level from the middorsal region of each squirrel. Guard hairs were measured three times to the nearest millimeter and averaged, and underfurs were measured as a group to the nearest millimeter. Statistical analyses included mean, standard deviation, and a t-test on the two respective means (agouti and nonagouti squirrels), with the null hypothesis that the two means were the same.

Nonagouti Abert's Squirrel guard hairs ($n = 14$) averaged 23.52 mm in length; Agouti guard hairs ($n = 9$) averaged 20.92 mm. For underhairs, nonagouti ($n = 14$) averaged 15.14 mm and agouti ($n = 9$) averaged 13.00 mm. A T-test was performed on these data and the null hypothesis that the two means were identical was rejected ($p < .001$).

Dark and light pelage appear to be equally effective in heat conservation at lower temperatures (Creed and Sharp 1958), so if response to cold alone were responsible for the maintenance of the polymorphisms discussed here, one could just as likely find a race of lighter than normal squirrels at higher elevations or in northern latitudes, assuming these

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genes were not deleterious in other ways. However, if genes for longer pelage were associated through linkage or pleiotropism with genes for darker color, the gene or genes could be selected for in colder areas. To confirm this hypothesis, it is necessary to determine the genetic basis for coat color polymorphism more accurately and, having done that, sample the squirrels in their natural habitat while obtaining climatological data for the area of capture. This would determine whether or not there is a significant difference in average climate.

If there is a link between color phase and hair length in sciurids, it may explain why there do not appear to be many races of lighter than normal squirrels in the northern portions of their ranges.

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